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DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

Mostly a warm and dry month; cool in southern Rocky Mountain region, along the Gulf and Atlantic coasts, in New England and the eastern part of the lake region. Monthly extremes of temperature were exceptional; in some localities the highest temperature of record for the month occurred; in still others the minimum for the month was as low as previously recorded and in a few cases 1 or 2 degrees lower.

More than the normal rain fell in the southern Rocky Mountain region, in Washington, Texas, and at isolated places elsewhere.

CYCLONES AND ANTICYCLONES

By W. P. DAY

The month was typical with respect to the general character of the HIGHS and LOWS, which began to resemble the less active summer types. The relatively large number of LOWS plotted, 17, was due in part to the development of small barometric disturbances in the troughs of low pressure, which carried on for a few observations and then dissipated, followed by new developments as the trough moved slowly eastward.

The HIGHS were generally weak and few in number, there being only about half the number noted in February and March of this year. The minimum number for any month usually occurs in June in the United States, corresponding to the summer solstice with its lessened polar-equatorial temperature gradient.

FREE-AIR SUMMARY

By V. E. JAKL

Free-air temperature departures from the normal on the whole followed those at the surface, and consequently were practically the same as those shown on Chart III, this REVIEW. Free-air relative humidities were about normal.

Resultant winds showed no important departures from the normal. (See Table 2.) Directions were generally southwesterly near the surface, changing gradually to about west-northwest at altitudes of 4,000 meters and above. The best example of east component winds extending to high altitudes was observed on the 11th and 12th at Lansing, Ellendale, Madison, and Royal Center, in connection with an extensive HIGH covering northern and western sections, with a LOW over the southeastern States. The highest velocity was 46 m. p. s. from the north-northwest at 2,750 meters, recorded at Burlington on the 12th, in the rear of a LOW over Newfoundland.

A number of interesting examples of vertical convectional currents due principally to insolation are shown by two-theodolite pilot-balloon observations at Ellendale. The effect of a rapid rise in surface temperature on the 4th was shown by an ascending current in the afternoon which extended without interruption and at an almost uniform rate of about 4 m. p. s. up to 4,200 meters. The kite flight on this date, reaching 3,500 meters, showed a dry adiabatic lapse rate throughout the extent of the observation. On the 14th an observation at 1 p. m. showed an ascending current of about 1.5 m. p. s., extending to 2,000 meters, while at 4 p. m. a descending current of about 0.8 m. p. s. extended from 900 meters to 1,700 meters. The kite

flight showed a dry adiabatic rate to 2,100 meters, above which was an inversion. On the 17th the balloon encountered a descending current of about 2 m. p. s. from 900 meters to 1,300 meters and an ascending current of about 1.7 m. p. s. from 2,000 meters to 3,400 meters. This observation was also made under conditions of high lapse rate. Incidentally in all these three cases, relative humidities as far aloft as observed were rather low.

Another instance of ascending current under quite different circumstances, viz, in a thunderstorm, is shown by a kite flight at Royal Center on the 17th. An extract from the report of the station, also the record of this flight, follows:

The week was generally showery with thunderstorms, which made kite flying rather dangerous. On the 17th the kites were struck by lightning when they were caught in a quickly developing thunderstorm that was attended by rain and hail. The record shows a very rapid ascent of the kites beginning at 2:35 p. m. and continuing until the wire was destroyed by lightning at 2:54 p. m. This rapid rise was due to the strong ascending current under the storm cloud. The headkite continued to rise for a minute after the wire was burned and then fell abruptly, its fall being due either to having become heavy with moisture or having fallen out of the ascending current.

Altitude m. s. l.	Temperature	Δt 100 m	Relative humidity	Wind	
				Direction	Velocity
<i>Meters</i>	<i>° C.</i>		<i>%</i>		<i>M. p. s.</i>
225 (surface).....	25.9	-----	44	W-----	5
574.....	21.7	1.20	44	W-----	7
1406.....	11.8	1.19	69	W-----	12
2163.....	5.2	.87	94	W-----	8
2605.....	3.2	.45	95	W-----	8

Peculiarly, the lapse rate in this record diminishes with altitude, while the humidity increases to practically the saturation point at the top. It is therefore to be inferred that the thunderstorm was not a purely local one and that the strong ascending current was due to causes other than simple thermal convection.

The occasionally observed instances of a reversal of the normal increase of wind velocity with altitude are well illustrated in a number of afternoon observations. Morning observations under these conditions show a rapid increase in velocity for the first few hundred meters, followed by a steady decrease to some fairly high altitude. The convection that later arises following the disappearance of the nocturnal temperature inversion causes an increase in surface velocity, and therefore a more or less regular fall in velocity from the ground upward results. A well-defined example was recorded at Ellendale on the 1st, when a north wind diminished gradually from a surface velocity of 13 m. p. s. to 1 m. p. s. at 3,200 meters, above which it changed abruptly with increasing velocity to south-southwest. Ordinarily, however, under these conditions, some increase in velocity with altitude is still evident in the first few hundred meters, even in mid-afternoon, as at Broken Arrow on the 27th, where a south-southeast wind increased from 10 m. p. s. to 18 m. p. s. in the first 400 meters, but thence diminished steadily to 1 m. p. s. at 2,600 meters.

An airplane observation at the Naval Air Station at Washington on the 27th shows the possibilities of obtaining free-air records to great altitudes by this method. The flight extended to 6,165 meters altitude, in a wind ranging from light northeast on the ground to strong northwest in the upper few thousand meters. The lapse rate averaged 0.42, with small inversions at 1,300 meters and 2,400 meters.